Episodes 69-70: Animal Diversity

Synopsis

In this episode we explore the diversity of the animal kingdom. I first discuss the history of taxonomy and give an overview of some key concepts such as morphological similarity, phylogenetic analysis, systematics, cladistics, binomial classification, and the taxonomic hierarchy. Then follows an explanation of the diversity of and relationships between the major animal phyla, including arthropods, echinoderms, molluscs, and many others, with special emphasis is given to the classes and orders in the phylum of chordata (vertebrates).

Continuing from Episode 69, I explore the diversity of the mammals, looking at all the mammalian orders and their major families. Special focus is given to primates and particularly hominids, which are discussed at the species level.

Taxonomy and Classification

- Taxonomy is the science of defining groups of biological organisms on the basis of shared characteristics and giving names to those groups
- Organisms are grouped together into taxa (singular: taxon) and given a taxonomic rank; groups of a given rank can be aggregated to form a super group of higher rank and thus create a taxonomic hierarchy
- The Swedish botanist Carolus Linnaeus is regarded as the father of taxonomy, as he developed a system known as Linnaean classification for categorization of organisms and binomial nomenclature for naming organisms
- The greatest innovation of Linnaeus, and still the most important aspect of this system, is the general use of binomial nomenclature, the combination of a genus name and a second term, which together uniquely identify each species of organism within a kingdom
- The Linnaean system has proven robust and it remains the only extant working classification system at present that enjoys universal scientific acceptance
- Species can be placed in a ranked hierarchy, starting with either *domains* or *kingdoms*. Domains are divided into kingdoms. Kingdoms are divided into *phyla* (singular: *phylum*) — for animals; the term *division*, used for plants and fungi, is equivalent to the rank of phylum (and the current International Code of Botanical Nomenclature allows the use of either term). Phyla (or divisions) are divided into *classes*, and they, in turn, into *orders*, *families*, *genera* (singular: *genus*), and *species* (singular: *species*)
- With the advent of such fields of study as phylogenetics, cladistics, and systematics, the Linnaean system has progressed to a system of modern biological classification based on the evolutionary relationships between organisms, both living and extinct
- Phylogenetics is the study of evolutionary relationships among groups of organisms (e.g. species, populations), which are discovered through molecular sequencing data and morphological data matrices
- Taxonomy—the classification, identification and naming of organisms—is usually richly informed by phylogenetics, but remains a methodologically and logically distinct discipline
- The degree to which taxonomies depend on phylogenies differs depending on the school of taxonomy: phenetics ignores phylogeny altogether, trying to represent the similarity between organisms instead; cladistics (phylogenetic systematics) tries to reproduce

phylogeny in its classification without loss of information; evolutionary taxonomy tries to find a compromise between them in order to represent stages of evolution

- Cladistics is an approach to biological classification in which organisms are grouped together based on whether or not they have one or more shared unique characteristics that come from the group's last common ancestor and are not present in more distant ancestors
- Phylogeny -> The evolutionary history of a species or group of related species.
  Systematics -> The study of biological diversity in an environmental context, encompassing taxonomy and involving the reconstruction of phylogenetic history
- In biology, a **taxon** (plural **taxa**; back-formation from **taxonomy**) is a group of one or more populations of an organism or organisms seen by taxonomists to form a unit
- Many modern systematists, such as advocates of phylogenetic nomenclature, use cladistic methods that require taxa to be monophyletic (all descendants of some ancestor). Their basic unit, therefore, is the clade rather than the taxon. Among those contemporary taxonomists working with the traditional Linnean (binomial) nomenclature, however, few propose taxa they know to be paraphyletic
- Ranks are assigned based on subjective dissimilarity, and do not fully reflect the gradational nature of variation within nature. In most cases, higher taxonomic groupings arise further back in time: not because the rate of diversification was higher in the past, but because each subsequent diversification event results in an increase of diversity and thus increases the taxonomic rank assigned by present-day taxonomists.[14]
- Of these many ranks, the most basic is species. However, this is not to say that a taxon at any other rank may not be sharply defined, or that any species is guaranteed to be sharply defined. It varies from case to case. Ideally, nowadays, a taxon is intended to represent a clade, that is, the phylogeny of the organisms under discussion, but this is not a requirement
- **Wastebasket taxon** (also called a **wastebin taxon**,[1] **dustbin taxon**[2] or **catch-all taxon**[3]) is a term used in some taxonomic circles to refer to a taxon that has the sole purpose of classifying organisms that do not fit anywhere else
- The familiar category of invertebrates is an "everything-else" category, comprising all animals without backbones.
- The kingdom Protista is composed of all eukaryotes that are not animals, plants or fungi, leaving to the protistans all single celled eukaryotes
- Antelopes comprise a wastebasket taxon (miscellaneous group) within the family Bovidae, encompassing those Old World species that are neither cattle, sheep, water buffalo, bison, nor goats

Kingdoms

- Carolus Linnaeus (1707–1778) laid the foundations for modern biological nomenclature, now regulated by the Nomenclature Codes, in 1735. He distinguished two kingdoms of living things: *Regnum Animale* ('animal kingdom') and *Regnum Vegetabile* ('vegetable kingdom', for plants). Linnaeus also included minerals in his classification system, placing them in a third kingdom, *Regnum Lapideum*
- At first, microscopic organisms were classified within the animal and plant kingdoms. However, by the mid-19th century, it had become clear to many that "the existing dichotomy of the plant and animal kingdoms [had become] rapidly blurred at its boundaries

and outmoded".[20] In 1866, Ernst Haeckel proposed a third kingdom of life, the Protista, for "neutral organisms" which were neither animal nor plant

- The development of the electron microscope revealed important distinctions between those unicellular organisms whose cells do not have a distinct nucleus (prokaryotes) and those unicellular and multicellular organisms whose cells do have a distinct nucleus (eukaryotes). In 1938, Herbert F. Copeland proposed a four-kingdom classification, elevating the protist classes of bacteria (Monera) and blue-green algae (Phycochromacea) to phyla in the novel Kingdom Monera
- The importance of the distinction between prokaryotes and eukaryotes gradually became apparent. In the 1960s, Stanier and van Niel popularised Édouard Chatton's much earlier proposal to recognise this division in a formal classification. This required the creation, for the first time, of a rank above kingdom, a *superkingdom* or *empire*, later called a *domain*
- The resulting five-kingdom system, proposed in 1969 by Whittaker, has become a popular standard and with some refinement is still used in many works and forms the basis for new multi-kingdom systems. It is based mainly upon differences in nutrition; his Plantae were mostly multicellular autotrophs, his Animalia multicellular heterotrophs, and his Fungi multicellular saprotrophs. The remaining two kingdoms, Protista and Monera, included unicellular and simple cellular colonies

The Animal Kingdom

- Animals have several characteristics that set them apart from other living things. They are eukaryotic and mostly multicellular, which separates them from bacteria and most protists
- They are heterotrophic, generally digesting food in an internal chamber, which separates them from plants and algae
- They are also distinguished from plants, algae, and fungi by lacking rigid cell walls
- All animals are motile, if only at certain life stages
- The ability of animals to move in complex ways is largely dependant upon their lack of cell walls, and also the evolution of specialised tissues such as muscle and nerve cells

Animal Phyla

The traditional classification system for animals has 35 phyla, and is based upon observable morphological differences. Phyla in order of size:

- Arthropoda: 1.15 million
- Mollusca: 85,000
- Chordata: 60,000
- *Platyhelminthes (flatworms): 30,000
- *Nematoda: 25,000
- *Annelida: 17,000
- Echinodermata: 6,000
- ^Cnidaria: 10,000
- ^Porifera: 9,000
- ^Bryozoa: 4,000
- ^Rotifera: 2,000
- ^Nemertea: 1,200

- ^Tardigrada: 1,000
- About 22 additional phyla with less than 1000 species each, mostly various forms of worms

Animal Classes

Sea Creatures

Phylum Porifera (9,000 species): sponges
- Class Calcarea (400 species): characterized by spicules made out of calcium carbonate
- Class Demospongiae (8,000 species): generally cup-shaped, various other differences
- Class Hexactinellida (few species): skeletons are made of spicules consisting of fibers of the protein sponging and/or the mineral silica

Phylum Bryozoa (4,000 species): moss animals
- Class Gymnolaemata: mostly marine, live under seawater and grow on surfaces of rocks
- Class Phylactolaemata: live in freshwater environments and lack a mineralised exoskeleton
- Class Stenolaemata: marine, have strongly calcified walls

Phylum Cnidaria (10,000 species): corals, jellyfish, hydra
- Class Anthozoa (6,100 species): anemones, coral reef plant like
- Class Cubozoa (36 species): box jellyfish
- Class Hydrozoa (3,500 species): small predatory animals; freshwater jellies, freshwater polyps, air ferns
- Class Scyphozoa (200 species): true jellyfish

Phylum Rotifera (2,200 species): wheel animals, very small water-dwelling creatures
- Class Bdelloidea (350 species): freshwater dwellers
- Class Monogononta (1,500 species): freshwater, soil and marine
- Class Seisonidea (3 species): parasitic on marine crustaceans

Phylum Nemertea (1,200 species): ribbon worms
- Class Anopla (550 species): without spines
- Class Enopla (650 species): with spines

Phylum Tardigrada (1,000 species): microscopic, water-dwelling, segmented animals with eight legs
- Class Eutardigrada: Primarily freshwater bound
- Class Heterotardigrada: mixed habitat, have cephalic appendages and legs with four digits

Worms

Phylum Platyhelminthes (30,000 species): flatworms
- Class Cestoda (1,000 species): parasites that inhabit the digestive tract of vertebrates
- Class Monogenea (4,500 species): small parasitic flatworms found on skin or gills of fish
- Class Trematoda (20,000 species): flukeworms, parasites of molluscs and vertebrates
- Class Turbellaria (4,500 species): all non-parasitic flatworms

Phylum Nematoda (25,000 species): roundworms, with tubular digestive systems

Phylum Annelida (17,000 species): segmented worms
- Class Hirudinea (few species): mostly leeches; freshwater, terrestrial, and marine
- Class Oligochaeta (5,000 species): have few chetae and no parapodia, marine and terrestrial
- Class Polychaeta (12,000 species): multiple chetae per segment and parapodia, most marine

Echinoderms

Phylum Echinodermata (6,000 species): starfish, brittle stars, sea urchins

- Class Crinoidea (540 species): marine animals that look like plants, having a stem, a mouth and feeding arms; can live on ocean floor or as free-swimmers
- Class Asteroidea (2,000 species): starfish
- Class Ophiuroidea (1,500): brittle stars, similar to starfish but found in deep waters and have long slender, whip-like arms used for locomotion
- Class Concentricycloidea (3 species): Sea daisies, kind of like circular starfish
- Class Echinoidea (700 species): sea urchins, small, spiny, globular animals
- Class Holothuroidea (1,200 species): sea cucumbers, marine animals with a leathery skin and an elongated body

Molluscs

Phylum Mollusca (85,000 species): snails, oysters, cephalopods, some worms

- Class Caudofoveata (120 species): worm-like organisms, live near seabed
- Class Aplacophora (200 species): worm-like organisms, live near seabed
- Class Monoplacophora (31 species): ancient lineage of molluscs with cap-like shells
- Class Polyplacophora (1000 species): chitons, live in rocky tidal zone and on seabed
- Class Scaphopoda (500 species): tusk shells, live in ocean
- Class Bivalvia (20,000 species): clams, oysters, scallops, mussels; live in ocean and freshwater
- Class Cephalopoda (900 species): squid, octopus, cuttlefish, nautilus; live in ocean
- Class Gastropoda (70,000 species): all snails and slugs, ocean, freshwater, land

Arthropods

Phylum Arthropoda (1,150,000 species): spiders, insects, crabs, shrimp, centipedes

- Subphylum Chelicerata (77,000 species): spiders and scorpians
  - Class Arachnida (75,000 species): spiders, scorpions, harvestmen, ticks, mites
  - Class Pycnogonida (1,300 species): sea spiders
- Subphylum Crustacea (70,000 species): shrimp, crabs, lobsters, some plankton
  - Class Branchiopoda (1000 species): shrimp and other freshwater plankton
  - Class Malacostraca (40,000 species): crabs, lobsters, shrimp, krill
  - Class Maxillopoda (15,000 species): barnacles, copepods
  - Class Ostracoda (13,000 species): small marine plankton
- Subphylum Hexapoda (1,000,000 species): insects
  - Class Entognatha: tiny wingless insects
  - Class Insecta (1,000,000): flies, termites, lice, beetles, bees, ants, moths, flees, earwigs
    - Order Protura (732 species): coneheads, tiny soil insects
    - Order Collembola (3,600 species): springtails
    - Order Thysanura (200 species): silverfish
    - Order Diplura (800 species): two-pronged bristletails
    - Order Ephemeroptera (2,500 species): mayflies
    - Order Odonata (5,900 species): dragonflies and damselflies
    - Order Plecoptera (3,500 species): stoneflies
    - Order Notoptera (30 species): icebugs, rock crawlers
    - Order Orthoptera (18,000 species): grasshoppers, crickets, locusts, weta, lubber
    - Order Phasmida (3,000 species): stick insects, walking sticks
    - Order Dermaptera (2,000 species): earwigs
    - Order Embioptera (360 species): webspinners

        - Order Mantodea (2,400 species): mantises
        - Order Blattodea (3,400 species): cockroaches
        - Order Isoptera (3,100 species): termites
        - Order Zoraptera (39 species): look like winged termites
        - Order Psocoptera (5,500 species): barklice and booklice
        - Order Mallophaga (3,000 species): biting lice
        - Order Siphunculata (500 species): sucking lice
        - Order Hemiptera (80,000 species): 'true bugs'; cicadas, aphids, leafhoppers
        - Order Thysanoptera (5,000 species): thrips, tiny winged insects
        - Order Neuroptera (6,000 species): lacewings, mantidflies, antlions
        - Order Coleoptera (400,000 species): beetles
        - Order Strepsiptera (600 species): twisted-wing parasites, sort of ant-like
        - Order Mecoptera (550 species): scorpionflies
        - Order Siphonaptera (2,400 species): fleas
        - Order Diptera (120,000 species): flies; mosquitos, midges, gnats, fruit fly
        - Order Lepidoptera (175,000 species): butterflies and moths
        - Order Trichoptera (12,000 species): caddisflies
        - Order Hymenoptera (150,000 species): ants, wasps, bees, sawflies
- Subphylum Myriapoda (15,000 species): centipedes and millipedes
    - Class Chilopoda (3,000 species): centipedes
    - Class Diplopoda (12,000 species): millipedes
    - Class Pauropoda (500 species): sort of a cross between centipedes and millipedes
    - Class Symphyla (200 species): resemble centipedes, but smaller and translucent; dwell in the soil

Chordates

Phylum Chordata (60,000 species): fish, mammals, birds, reptiles

- Subphylum Tunicate (3,000 species): underwater filter feeders
    - Class Ascidiacea (2,300 species): sea squirts
    - Class Thaliacea (600 species): free-floating filter feeders
    - Class Larvacea (70 species): small, transparent, live in upper ocean
    - Class Sorberacea (7 species): look similar to sea squirts
- Subphylum Cephalochordata (30 species): lancelets
- Superclasss Agnatha (100 species): jawless fish
- Superclass Incertae sedis (900 species): cartilaginous fishes
- Superclass Osteichthyes (30,000 species): bony fish
    - Class Actinopterygii (29,900 species): ray-finned fishes
    - Class Sarcopterygii (8 extant species): lobe-finned fishes
- Superclass Tetrapoda (28,000 species): four-limbed animals
    - Class Amphibia (6,000 species): amphibians
    - Class Reptilia (8,000 species): reptiles
    - Class Aves (10,000 species): birds
    - Class Mammalia (5,500 species): mammals

Chordate Orders

Phylum Chordata (60,000 species): fish, mammals, birds, reptiles

- Subphylum Tunicate (3,000 species): underwater filter feeders
    - Class Ascidiacea (2,300 species): sea squirts
    - Class Thaliacea (600 species): free-floating filter feeders
    - Class Larvacea (70 species): small, transparent, live in upper ocean
- Subphylum Cephalochordata (30 species): lancelets
    - Class Leptocardii (30 species): lancelets
- Superclasss Agnatha (100 species): jawless fish
    - Class Myxini (65 species): hagfish
    - Class Cephalaspidomorphi (35 species): lampreys
- Superclasss Chondrichthyes (900 species): cartilaginous fishes
- Superclasss Osteichthyes (30,000 species): bony fish
    - Class Actinopterygii (29,900 species): ray-finned fishes
        - Order Polypteriformes: bichirs and reedfishes
        - Order Acipenseriformes: sturgeons and paddlefishes
        - Order Lepisosteiformes: gars
        - Order Amiiformes: bowfins
        - Order Osteoglossiformes: bony-tongued fishes
        - Order Hiodontiformes: mooneye and goldeye
        - Order Elopiformes: ladyfishes and tarpon
        - Order Albuliformes: bonefishes
        - Order Notacanthiformes: halosaurs and spiny eels
        - Order Anguilliformes: true eels
        - Order Saccopharyngiformes: gulper eel
        - Order Clupeiformes: herrings and anchovies
        - Order Gonorynchiformes: milkfishes
        - Order Cypriniformes: barbs, carp, danios, goldfishes, loaches, minnows,
        - Order Characiformes: characins, pencilfishes, hatchetfishes, piranhas, tetras
        - Order Gymnotiformes: electric eels and knifefishes
        - Order Siluriformes: catfishes
        - Order Argentiniformes: barreleyes and slickheads
        - Order Salmoniformes: salmon and trout
        - Order Esociformes pike
        - Order Osmeriformes: smelts and galaxiids
        - Order Ateleopodiformes: jellynose fish
        - Order Stomiiformes: bristlemouths and marine hatchetfishes
        - Order Aulopiformes: Bombay duck and lancetfishes
        - Order Myctophiformes: lanternfishes
        - Order Lampriformes: oarfish, opah and ribbonfishes
        - Order Polymixiiformes: beardfishes
        - Order Percopsiformes: cavefishes and trout-perches
        - Order Batrachoidiformes: toadfishes
        - Order Lophiiformes: anglerfishes
        - Order Gadiformes: cods
        - Order Ophidiiformes: pearlfishes
        - Order Mugiliformes: mullets

        - Order Atheriniformes: silversides and rainbowfishes
        - Order Beloniformes: flyingfishes
        - Order Cetomimiformes: whalefishes
        - Order Cyprinodontiformes: livebearers, killifishes
        - Order Stephanoberyciformes: ridgeheads
        - Order Beryciformes: fangtooths and pineconefishes
        - Order Zeiformes: dories
        - Order Gobiesociformes: clingfishes
        - Order Gasterosteiformes: sticklebacks
        - Order Syngnathiformes: seahorses and pipefishes
        - Order Synbranchiformes: swamp eels
        - Order Tetraodontiformes: filefishes and pufferfish
        - Order Pleuronectiformes: flatfishes
        - Order Scorpaeniformes: scorpionfishes and the sculpins
        - Order Perciformes: 40% of all fish, including anabantids, centrarchids cichlids, gobies, gouramis, mackerel, tuna, perches, scats, whiting, wrasses
    - Class Sarcopterygii (8 extant species): lobe-finned fishes
        - Order Ceratodontiformes (1 species): Australian lungfish
        - Order Lepidosireniformes (5 species): African and SA lungfish
        - Order Actinistia (2 species): coelacanth
- Class Amphibia (6,000 species)
    - Order Anura (5,600 species): frogs and toads
    - Order Caudata (500 species): salamanders and newts
    - Order Apoda (170 species): caecilians; look sort of like snakes
- Class Reptilia (8,000 species)
    - Order Crocodilia (23 species): crocodiles, gavials, caimans, and alligators
    - Order Sphenodontia (2 species): tuataras from New Zealand
    - Order Squamata (7,900 species): lizards, snakes, and worm lizards
    - Order Testudines (300 species): turtles and tortoises
- Class Aves (10,000 species)
    - Subclass Neognathae (9,940 species): most modern flying birds
        - Order Anseriformes (150 species): waterfowls
        - Order Galliformes (290 species): turkey, chicken, pheasant, quail, grouse
        - Order Sphenisciformes (20 species): penguins
        - Order Gaviiformes (5 species): loons, aquatic birds
        - Order Podicipediformes (22 species): grebes, diving birds
        - Order Procellariiformes (125 species): albatrosses, petrels and allies
        - Order Pelecaniformes (60 species): pelicans and allies
        - Order Ciconiiformes (20 species): storks and allies
        - Order Phoenicopteriformes (6 species): flamingos
        - Order Accipitriformes (225 species): eagles, hawks, vultures; birds of prey
        - Order Falconiformes (290 species): falcons, diurnal birds of prey
        - Order Turniciformes (16 species): button-quail
        - Order Opisthocomiformes (1 species): Hoatzin
        - Order Gruiformes (180 species): cranes and allies

            - Order Charadriiformes (350 species): plovers and allies
            - Order Pterocliformes (16 species): sandgrouse
            - Order Columbiformes (310 species): doves and pigeons
            - Order Psittaciformes (370 species): parrots, cockatoos, strigopoidea
            - Order Cuculiformes (138 species): cuckoos
            - Order Strigiformes (200 species): true owls and barn-owls, nocturnal
            - Order Caprimulgiformes (107 species): nightjars and allies
            - Order Apodiformes (450 species): swifts
            - Order Coliiformes (6 species): mousebirds
            - Order Trogoniformes (39 species): trogons
            - Order Coraciiformes (90 species): kingfishers, bee-eaters
            - Order Galbuliformes (400 species): jacamars and puffbirds
            - Order Piciformes (400 species): woodpeckers, toucans, barbets, puffbirds
            - Order Passeriformes (5,000 species): many song-birds, crows, ravens, wrens, warblers, sparrows, finches, robins
        - Subclass Palaeognathae (60 species): flightless birds and tinamou
            - Order Struthioniformes (12 species): ostriches, emus, rheas, kiw
            - Order Tinamiformes (47 species): tinamou, small S. Am bird
- Class Mammalia (5,500 species)
    - Subclass Theria (2 species): egg-laying mammals
        - Order Monotremata (2 species): echidna and platypus
    - Infraclass Metatheria (330 species): marsupials, carry young in pouch
        - Order Didelphimorphia (103 species): opossums, Americas
        - Order Paucituberculata (6 species): shrew opossums, Americas
        - Order Microbiothera (1 species): monito del monte 'little bush monkey'
        - Order Dasyuromorphia (70 species): most carnivorous marsupials
        - Order Peramelemorphia (22 species): bandicoots and bilbies
        - Order Notoryctemorphia (2 species): marsupial moles
        - Order Diprotodontia (120 species) most herbivorous marsupials
    - Subclass Eutheria (5,200 species): placental mammals, fetus and placenta
        - Order Rodentia (2,300 species): rats, mice, gophers, squirrels, beavers, hamsters, porcupines, guinea pigs
        - Order Chiroptera (1,100 species): bats
        - Order Insectivora (538 species): moles, shrews and hedgehogs
        - Order Primates (400 species): lemurs, monkeys, apes
        - Order Carnivora (280 species): cats, dogs, bears, seals, weasels, skunks
        - Order Artiodactyla (220 species): even-toed ungulates; cows, pigs, sheep
        - Order Perissodactyla (18 species): odd-toed ungulates; horses, rhinos
        - Order Cetacea (89 species): whales, dolphins, porpoises
        - Order Lagomorpha (80 species): hares, rabbits and pika
        - Order Xenarthra (29 species): anteaters, tree sloths, and armadillos
        - Order Pholidota (8 species): pangolin, only known scaly mammal
        - Order Sirenia (4 species): sea cows
        - Order Hyracoidea (4 species): hyrax, small rodent-like animal
        - Order Proboscidea (3 species): elephants and mammoths

        - Order Dermoptera (2 species): gliding arboreal 'flying lemurs'
        - Order Tubulidentata (1 species): the aardvark

Mammalian Families

- Subclass Theria (2 species): egg-laying mammals
    - Order Monotremata (2 species): echidna and platypus
        - Family Tachyglossidae (1 species): echidnas
        - Family Ornithorhynchidae (1 species): platypuses
- Infraclass Metatheria (330 species): marsupials, carry young in pouch
    - Order Didelphimorphia (103 species): opossums, Americas
    - Order Paucituberculata (6 species): shrew opossums, Americas
    - Order Microbiothera (1 species): monito del monte 'little bush monkey'
    - Order Peramelemorphia (22 species): bandicoots and bilbies
    - Order Dasyuromorphia (70 species): most carnivorous marsupials
        - Family Thylacinidae (1 species): Tasmanian tiger
        - Family Myrmecobiidae (1 species): numbat
        - Family Dasyuridae (72 species): Tasmanian devils, quolls, dunnarts, planigale
    - Order Diprotodontia (120 species): most herbivorous marsupials
        - Family Macropodidae (59 species): kangaroos, wallabies
        - Family Potoroidae (8 species): bettongs, potaroos and rat kangaroos
        - Family Phascolarctidae (1 species): koala
        - Family Vombatidae (3 species): wombats
        - Family Phalangeridae (28 species): nocturnal; brushtail possums, cuscuses
        - Family Burramyidae (5 species): pygmy possums
        - Family Pseudocheiridae (17 species): ringtailed possums
        - Family Petauridae (11 species): Striped Possum, Leadbeater's Possum, Yellow-bellied Glider, Sugar Glider, Mahogany Glider and Squirrel Glider
        - Family Tarsipedidae (1 species): honey possum
        - Family Acrobatidae (2 species): feathertail glider and feather-tailed possum
    - Order Notoryctemorphia (2 species): marsupial moles
- Subclass Eutheria (5,200 species): placental mammals, fetus and placenta
    - Order Rodentia (2,300 species): rats, mice, gophers, squirrels, beavers, hamsters
        - Family Aplodontiidae (1 species): mountain beaver
        - Family Sciuridae (285 species): squirrels
        - Family Castoridae (2 species): beavers
        - Family Geomyidae (35 species): pocket gophers
        - Family Heteromyidae: (60 species): kangaroo rats and kangaroo mice
        - Family Dipodidae (1 species): Laotion rock rat
        - Family Diatomyidae (50 species): jerboas and jumping mice
        - Family Muridae (700 species): true mice, rats, gerbils
        - Family Calomyscidae (8 species): mouse-like hamsters
        - Family Cricetidae (600 species): hamsters, rats and mice, muskrats, voles
        - Family Nesomyidae (68 species): climbing mice, rock mice, white-tailed rat
        - Family Platacanthomyidae (2 species): spiny dormice
        - Family Spalacidae (37 species): mole rats, bamboo rats, and zokors
        - Family Anomaluridae (7 species): scaly-tailed squirrels

        - Family Pedetidae (2 species): springhares
        - Family Ctenodactylidae (5 species): comb rats
        - Family Myoxidae (29 species): doormice
        - Family Bathyergidae (22 species): African mole rats
        - Family Hystricidae (11 species): Old World porcupines
        - Family Petromuridae (1 species): dassie rat
        - Family Thryonomyidae (2 species): cane rats
        - Family Erethizontidae (16 species): New World porcupine
        - Family Chinchillidae (7 species): chinchillas and viscachas
        - Family Dinomyidae (1 species): pacarna
        - Family Cuniculidae (3 species): pacas, large spotted rodents
        - Family Caviidae (13 species): cavies (guinea pigs), Patagonian hares
        - Family Dasyproctidae (13 species): agoutis and acouchis
        - Family Ctenomyidae (60 species): tuco-tuco
        - Family Octodontidae (12 species): octodonts
        - Family Abrocomidae (9 species): chinchilla rats
        - Family Echimyidae (25 species): spiny rats
        - Family Capromyidae (14 species): hutias
        - Family Myocastoridae (1 species): river rat
    - Order Chiroptera (1,100 species): bats, twenty families
        - Family Pteropodidae (186 species): old world fruit bats
        - Family Emballonuridae (51 species): sac-winged bats, tropical
        - Family Craseonycteridae (1 species): tiny bumblebee bat, endangered
        - Family Rhinopomatidae (6 species): mouse-tailed bats, live in arid regions
        - Family Nycteridae (16 species): hollow-faces bats
        - Family Megadermatidae (5 species): false vampire bats
        - Family Rhinolophidae (? species): horseshoe bats
        - Family Phyllostomidae (192 species): leaf-nosed bats, new world
        - Family Mormoopidae (13 species): mustached bats, new world
        - Family Noctilionidae (2 species): bulldog bats
        - Family Mystacinidae (2 species): New Zealand short-tailed bats
        - Family Molossidae (100 species): free-tailed bat, new world
        - Family Myzopodidae (2 species): Madagascar bats
        - Family Thyropteridae (5 species): disc-winges bats
        - Family Furipteridae (2 species): smoky bats
        - Family Natalidae (11 species): funnel-eared bats, new world
        - Family Vespertilionidae (300 species): vesper bats, worldwide
        - Family Hipposideridae (70 species): Old World leaf-nosed bats
    - Order Insectivora (538 species): moles, shrews and hedgehogs
        - Family Solenodontidae (2 species): solenodon, like big shrews
        - Family Tenrecidae (34 species): tenrecs found in Madagascar
        - Family Chrysochloridae (21 species): golden moles
        - Family Erinaceidae (24 species): hedgehogs
        - Family Soricidae (376 species): shrews
        - Family Talpidae (44 species): moles and shrew moles

        - Family Tupaiidae (20 species): treeshrews, small shrew-like
        - Family Macroscelididae (17 species): elephant shrew
    - Order Carnivora (280 species): cats, dogs, bears, seals, weasels, skunks
        - Family Felidae (41 species): lion, tiger, jaguar, leopard, lynx, puma, cheetah, domestic cat, other cats
        - Family Viverridae (28 species): sort of 'tree cats'; genets and civets
        - Family Herpestidae (34 species): mongoose
        - Family Hyaenidae (4 species): hyena
        - Family Canidae (35 species): dogs, wolfs, jackals, foxes, dingos
        - Family Ursidae (8 species): bears, including black, brown, polar, and pandas
        - Family Otariidae (15 species): sea lions, fur seals
        - Family Phocidae (19 species): seals
        - Family Odobenidae (1 species): walrus
        - Family Mustelidae (57 species): badgers, otters, weasels, martens, ferets
        - Family Procyonidae (14 species): raccons, coati, olingos, ringtails
    - Order Artiodactyla (220 species): even-toed hoofed animals
        - Family Suidae (16 species): domestic pigs, wild pigs, warthogs
        - Family Tayassuidae (4 species): peccaries, or New World pigs
        - Family Hippopotamida (2 species): hippopotamus and pygmy hippopotamus
        - Family Camelidae (6 species): camels, llamas and alpacas
        - Family Tragulidae (10 species): chevrotains, or mouse deer
        - Family Giraffidae (2 species): giraffe and okapi
        - Family Moschidae (4 species): musk deer
        - Family Cervidae (44 species): deer, including elk, moose, reindeer, chital
        - Family Bovidae (140 species): bison, buffalo, antelopes, gazelles, sheep, goats, cattle
    - Order Perissodactyla (18 species): odd-toed hoofed animals
        - Family Equidae (9 species): horses, donkeys, and zebras
        - Family Tapiridae (4 species): tapir
        - Family Rhinocerotidae (5 species): rhinoceros
    - Order Cetacea (89 species): whales, dolphins, porpoises
        - Family Balaenopteridae (9 species): rorqual whales (includes blue whale)
        - Family Eschrichtiidae (1 species): gray whale
        - Family Balaenidae (4 species): bowhead and right whales
        - Family Physeteridae (3 species): sperm whales
        - Family Ziphiidae (21 species): beaked whales
        - Superfamily Platanistidae (4 species): river dophin
        - Family Delphinidae (33 species): marine dolphins
        - Family Monodontidae (2 species): narwhal and beluga whale
        - Family Phocoenidae (6 species): porpoises
    - Order Lagomorpha (80 species): hares, rabbits and pika
        - Family Ochotonidae (30 species): pika
        - Family Leporidae (50 species): rabbits and hares
    - Order Xenarthra (29 species): anteaters, tree sloths, and armadillos
        - Family Bradypodidae (4 species): three-toed sloths

        - Family Megalonychidae (1 species): two-toed sloths
        - Family Dasypodidae (20 species): armadillos
        - Family Myrmecophagidae (3 species): anteaters
        - Family Cyclopedidae (1 species): silky anteaters
- Order Primates (400 species): lemurs, monkeys, apes
    - Suborder Strepsirrhini (113 species): lemurs, galagos and lorisids
        - Family Daubentoniidae (1 species): aye-aye (a lemur)
        - Family Lemuridae (22 species): lemurs
        - Family Lepilemuridae (26 species): sportive lemurs
        - Family Galagidae (20 species): bush babies
        - Family Lorisidae (11 species): lorisids
        - Family Cheirogaleidae (33 species): dwarf and mouse lemurs
    - Suborder Haplorhini (300 species): tarsiers, monkeys and apes
        - Family Tarsiidae (10 species): tarsiers
        - Family Callitrichidae (42 species): marmosets and tamarins
        - Family Cebidae (17 species): capuchins and squirrel monkeys
        - Family Aotidae (10 species): owl monkeys
        - Family Pitheciidae (42 species): titis, sakis and uakaris
        - Family Atelidae (28 species): howler and spider monkeys
        - Family Cercopithecidae (135 species): Old World monkeys
        - Family Hylobatidae (17 species): lesser apes (gibbons)
        - Family Hominidae (7 species): greater apes
            - Genus Pongo (2 species): orangutans
                - *Pongo pygmaeus*: Bornean orangutan
                - *Pongo abelii*: Sumatran orangutan
            - Genus Gorilla (2 species): gorillas
                - *Gorilla gorilla:* western gorilla
                - *Gorilla beringei*: eastern gorilla
            - Genus Pan (2 species): chimpanzees
                - *Pan troglodytes*: common chimpanzee
                - *Pan paniscus*: bonobo
            - Genus Homo (1 species): humans
                - *Homo sapiens*: modern humans